

## REMARKS

Claims 1-5 and 7-36 are pending. Claims 6 has been canceled.

### **35 U.S.C. § 103 rejection of claims 1-14 and 16-36**

The examiner has rejected claims 1-14 and 16-36 under § 103(a) over Visco, et al., U.S. Pat. No. 5,882,812, in view of Visco, et al., U.S. Pat. No. 6,432,584 and Gan, et al., U.S. Pat. No. 6,136,477.

In the examiner's view, Visco '812 and Visco '584 teach all of the limitations of the current invention with the exception of the inclusion of organic nitrates in the electrolyte, an omission that the examiner expressly acknowledges. The examiner argues, however, that Gan "teaches that it is well known in the art to employ organic nitrates in electrolytes of lithium cells, in order to achieve high charge/discharge capacity, long cycle life and to minimize the first cycle irreversible capacity" and that, based thereon, "it would have been obvious to one of ordinary skill in the art at the time the instant invention was made to employ the conventional electrolyte solvent mixtures and lithium trifluoromethanesulfonimide Visco '584 in cell of Visco '812 because the selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp.

..."

Applicant traverses.

### **Applicant's response**

While applicant does not necessarily accede to all or any of the examiner's arguments regarding the relationship of Visco '812 and Visco '584 to the instant invention and expressly reserve the right to address each such argument on appeal if such is deemed necessary, applicant notes that the examiner has acknowledged that neither Visco '812 nor Visco '584 teach, suggest or motivate one skilled in the art to use organic nitrates in lithium-sulfur cells. Since it is applicant's position that the examiner has failed utterly to provide any reference that fills this critical void, applicant will herein address only this aspect of the examiner's rejection.

The examiner appears to be equating unrelated chemical species. That is, the examiner states that "Visco does not expressly disclose: organic nitrate additives such as nitromethane (claims 1, 4 & 6)...", that "...Visco 6,453,584 teaches ... (t)he

conventionality of lithium trifluoromethanesulfonimide ( $\text{LiN}(\text{CF}_3\text{SO}_2)_2$ )" that "Gan teaches that it is well known in the art to employ organic nitrates in electrolytes of lithium cells..." and that "... it would have been obvious to one of ordinary skill in the art at the time the instant invention was made to employ lithium trifluoromethanesulfonimide Visco '584 in cell fo Visco '812 because the selection of known material based on its suitability for its intended use supported a *prima facie* obviousness determination in Siclaur & Carroll v. Interchemical Corp. ...."

In the first place, nitromethane and lithium trifluoromethanesulfonimide are unambiguously and unequivocally not organic nitrates. Nitromethane has the chemical

structure and lithium trifluoromethanesulfonimide has the chemical

structure , while methyl nitrate, which would be the closest comparison compound to those expressly noted by the examiner, has the chemical

structure . Clearly, the compounds are substantially different and no one skilled in the art would confuse or attempt to interrelate them. Thus the examiner has failed to provide an example of an organic nitrate in either Visco reference.

Along the same line, it is noted that Visco '812 does mention nitrogen containing organic species but mentions only "organonitrogen compounds" and exemplifies such only with phenylhydrazine. In Visco '584, nitromethane is mentioned only as an electrolyte solvent. It is reasonable to assume that, as skilled artisans, the inventors in Visco '812 and Visco '584 were well aware of other organonitrogen species but failed to even mention such in the specification. It is equally reasonably to assume that this omission was intentional. Thus Visco '812 and Visco '584 themselves militate against the inclusion of organic nitrates as an element of their lithium-sulfur cells.

Further, Gan, while it does describe the use of organic nitrates in alkali metal electrochemical cells such as lithium cells, the cells of Gan are completely different from

those of the instant invention and suffer from totally disparate problems that are ostensibly resolved by the use of organic nitrates. That is, Gan states:

It is commonly known that when an electrical potential is initially applied to lithium ion cells constructed with a carbon anode in a discharged condition to charge the cell, some permanent capacity loss occurs due to anode surface passivation film formation. Gan, Col. 2, lines 19-23, emphasis added.

It is this permanent capacity loss and its prevention that Gan specifically addresses. Nowhere in Gan is sulfur so much as mentioned in any context. In particular there is no mention of lithium-sulfur cells nor is there any suggestion that the problems encountered with lithium-sulfur cells are the same or similar to those encountered with lithium-carbon cells. The cells of the instant invention expressly require "(a) a cathode comprising an electroactive sulfur-containing material." There is nothing mentioned in the instant application regarding "permanent capacity loss." The cells are entirely different, the compounds are entirely different and the problem to be solved is entirely different. Thus, the examiner's statement regarding establishment of *prima facie* obviousness is entirely unsupported.

Since the examiner has failed to provide any disclosure of a central element of independent claims 1 and 27, which are therefore patentable, all claims dependent thereon are likewise patentable.

The examiner is requested to reconsider and based thereon withdraw the rejection.

### **35 U.S.C. § 103 rejection of claim 15**

The examiner has rejected claim 15 under §103(a) as being unpatentable over Visco '812 in view of Visco '584, Gan and Lauck, U.S. Pat. No. 3,915,743.

As discussed above, the examiner is of the opinion that Visco '812, Visco '584 and Gan disclose each element of the instant invention. The examiner, however, admits that those references do not disclose diethylene glycol dimethyl ether as an electrolyte. The examiner invokes Lauck as teaching the equivalency of diethylene

glycol dimethyl ether and dimethoxymethane as electrolyte solvents for use in lithium-sulfur cells and thereupon argues the obviousness of claim 15.

Applicant traverses.

**Applicant's response**

As discussed in detail above, Visco '812, Visco '584 and Gan do not render any of the claims of the instant application unpatentable. Lauck does not supply the principal element that is missing in Visco '812, Visco '584 and Gan, namely, the use of organic nitrates in lithium-sulfur cells. Thus, claim 15, which depends from claim 1, is, as are all the other outstanding claims, patentable over Visco '812, Visco '584, Gan and Lauck.

The examiner is requested to reconsider and based thereon withdraw the rejection.

**CONCLUSION**

Based on the preceding remarks applicant believes that the current application is in condition for allowance and respectfully requests that it be passed to issue.

Applicant does not believe that a fee is due with this response. If such is incorrect, the Commissioner is authorized to charge any fee due to Squire, Sanders & Dempsey, LLP Deposit Account No. 19-3878.

Respectfully submitted,

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Date

By /Bernard J. Rose, Reg. No. 42,112/

Bernard J. Rose

Reg. No. 42,112

SQUIRE, SANDERS & DEMPSEY, LLP.  
1 E. Washington St., Suite 2700  
Phoenix, Arizona 85004  
Direct Dial: (415) 393-9882  
Telephone: (602) 528-4000  
Facsimile: (602) 253-8129